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**NEW TIMES OF MINIMA OF ECLIPSING BINARIES
VW Cep, U Cep AND RZ Cas**

VW Cephei (HD 197433 = BD +75°752 = SAO 9828) is a well observed active W UMa type binary. Its regular photometry was begun in 1992 at Szeged Observatory. The aim of this long term project is twofold. First, the light curve of the system shows temporal variation on short timescales (24 hours; Kreiner & Winiarski, 1981) as well as long timescales (6-8 years; Bradstreet & Guinan, 1988; 44 years; Karimie, 1983). Second, VW Cep is a member of a triple system (Hershey, 1975), its period is modulated by the light time effect, but the period variation of the system is quite complex. A detailed analysis of the period variation has been presented recently by Lloyd, Watson & Pickard (1992) and Vinkó et al. (1993).

Differential photoelectric photometry of VW Cephei was carried out on 3 nights in September, 1994 with a 40 cm Cassegrain telescope and an Optec SSP-5A photoelectric photometer. The light curve in Johnson V and B bands was obtained and it is presented in Figure 1. The comparison star was HD 199476 which was used previously by many observers.

Table 1 contains the heliocentric times of minima calculated from parabolic least-squares fit to the bottom of the minima. The O–C values were derived from the ephemeris given in the 4th edition of GCVS. The O–C of secondary minimum was calculated so that the time of the secondary minimum was expected at the 0.5 phase.

Our minimum times show that the period decrease of the system continues, in agreement with the conclusion of previous analyses by Lloyd, Watson & Pickard (1992) and Vinkó et al. (1993). The asymmetry of the light curve does not exceed 0.02 mag, which suggests that the next activity maximum proposed by Bradstreet & Guinan (1988) has not occurred yet.

The Algol type eclipsing binaries RZ Cas and U Cep were measured with an unfiltered ST4 CCD camera attached to a Telemator refractor. Only one minimum was observed in both cases. The comparison star of U Cep was HD 6006, while in the case of RZ Cas a nearby star (GSC 4317.1578; $V \sim 10.6$) was used as comparison.

The heliocentric times of minima of U Cep and RZ Cas are listed in Table 2. The O–C values are computed from the ephemeris given in the GCVS.

In the case of U Cep simultaneous BV photoelectric and CCD photometry was made. The comparison of data strongly suggests that the unfiltered CCD measurements are useful for detection of light minima of eclipsing binaries. Since the duration of the totality was longer than 0.075 day, the observed eclipse was an undisturbed one according to the definition of Crawford & Olson (1979). Figure 2 shows a part of the O–C diagram of U Cep computed using our new time of minimum and some recent measurements (Olson et al. 1985; Sato & Nishimura 1987; Surkova 1990; Burnett, Etzel & Olson 1993). From the slope of the fitted line the following ephemeris has been derived:

$$Hel.JDMinI = 2449602.5601 + 2.4930614 \times E$$

$$\pm .0010 \quad \pm .0000004$$

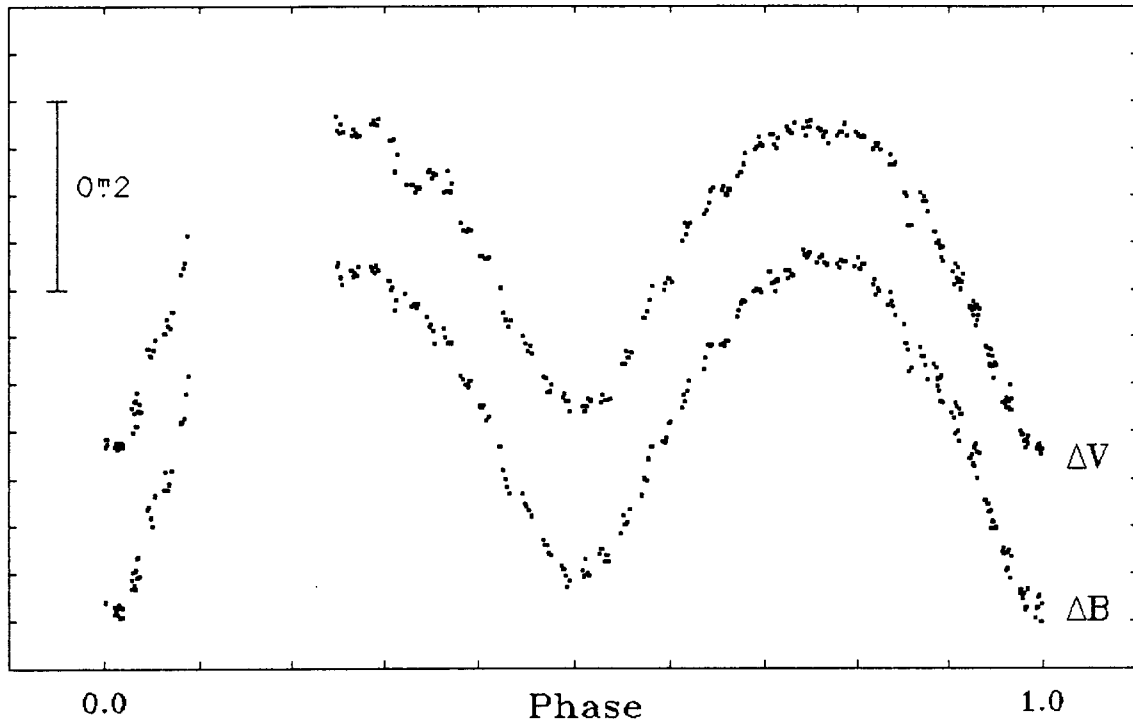


Figure 1. Differential B and V light curve of VW Cephei

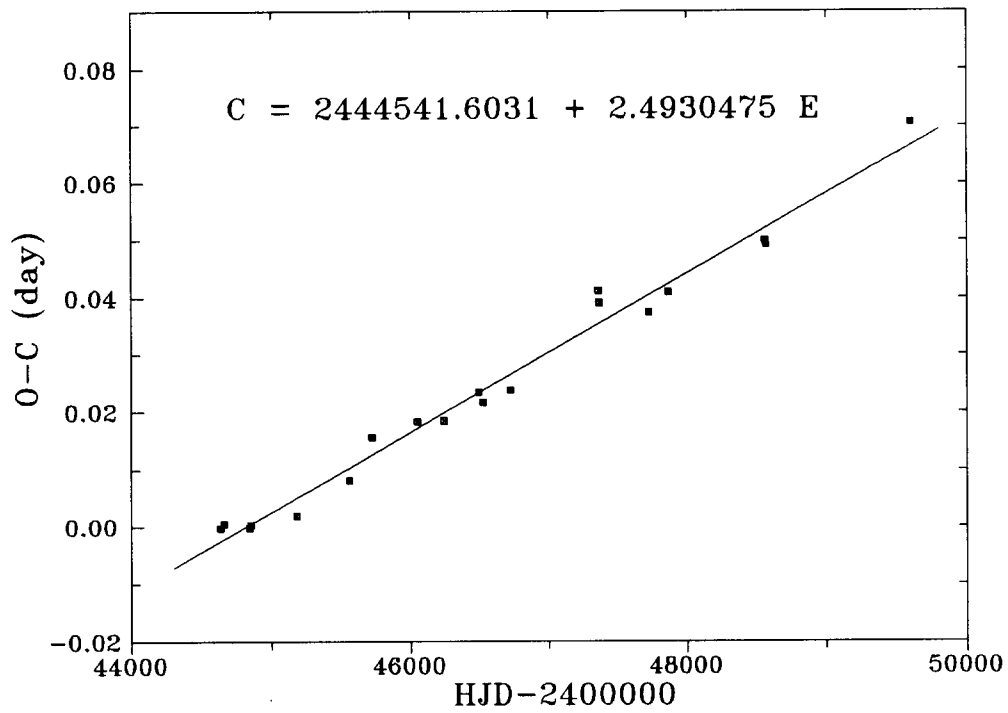


Figure 2. O-C diagram of U Cephei

Table 1. Minimum times of VW Cephei

Min (Hel.JD)	Type	O–C (days)
2449603.3761	I	–0.0971
2449608.3848	I	–0.0981
2449609.3603	II	–0.0967
2449609.4978	I	–0.0984

Table 2

Star	Min (Hel.JD)	type	O–C (days)
U Cep	2449602.5601	I	0.0706
RZ Cas	2449653.465	I	0.0201

Using the period values given in the GCVS and in this paper the rate of the period increase during the last 5000 days was also calculated, it is $dP/P = 6.849 \times 10^{-9} \text{ day/day}$.

A detailed analysis of period variation of RZ Cas has been presented recently by Hegedüs, Szatmáry & Vinkó (1991). They showed that the period variation contains four periodic components. However, it seems that our new time of minimum does not agree with the prediction of their O–C curve fitting.

The list of individual observations is available via e-mail from l.kiss@physx.u-szeged.hu (Internet).

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